

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD  
SAN FRANCISCO BAY REGION

ORDER NO. 91-111

REISSUING WASTE DISCHARGE REQUIREMENTS FOR:

SLUDGE STORAGE FACILITIES AND  
SLUDGE APPLICATION TO DEDICATED LANDFILL SITE

LAS GALLINAS VALLEY SANITARY DISTRICT  
SAN RAFAEL, MARIN COUNTY

The California Regional Water Quality Control Board, San Francisco Bay Region (hereinafter Board), finds that:

1. Las Gallinas Valley Sanitary District (hereinafter called the discharger) submitted a Report of Waste Discharge dated October 25, 1983 for the on-site storage and disposal of sewage sludge generated by the operation of wastewater treatment facilities. Waste Discharge Requirements, Order #84-37 were issued on June 20, 1984.
2. The discharger operates a secondary wastewater treatment plant which treats primarily domestic and commercial waste. The discharger is not required by Federal regulations to have a local pretreatment program. Effluent is discharged during the rainy season to Miller Creek, a tributary to San Pablo Bay. During the dry season, discharge to the creek is prohibited and the effluent is disposed of in-part through spray irrigation on adjacent agricultural lands. Additional disposal of effluent is achieved through the Marin Municipal Water District's (MMWD) reclamation program. This program provides reclaimed wastewater through a fixed irrigation system and a truck hauling program to a variety of industrial, commercial and residential users.
3. Sludge is generated from two sources, the discharger's secondary wastewater treatment process and MMWD's water reclamation facility. The sludge from the secondary wastewater treatment process is anaerobically digested before storage and land disposal.
4. Currently, during the winter months, sludge is stored in two existing sludge storage ponds located at the treatment plant site at the end of Smith Ranch Road (see Appendix A). These ponds have a capacity of 975,000 gallons.
5. Between May 1 and October 30 (designated dry season) the discharger trucks liquid sludge to the 11 acre dedicated sludge landfill and injects it six inches below the ground surface. Currently, the sludge injection truck travels along the Miller Creek levy approximately 2/3 of a mile each way between the existing sludge storage ponds

and the sludge disposal pasture. The discharger estimates that during the six month injection period the truck makes over 1,200 trips which creates dust, disturbs wildlife and the public using the adjacent public pathway.

6. The total amount of sludge which has been applied to the landfill is about 1,215 tons or 152 tons per acre (only 8 acres are currently in use). The amounts applied yearly have ranged from 10 to 52 dry tons.
7. The discharger proposes to construct three new sludge storage ponds with a storage capacity of 3.9 million gallons adjacent to the existing sludge disposal pasture (see Appendix A).
8. Chapter 15, Section 2511 of the Water Code exempts domestic sewage facilities from the provisions of Chapter 15, provided that the residual sludges or solid wastes are disposed of in accordance with the applicable provisions of Chapter 15. The proposed design for the sludge storage ponds meets all applicable Chapter 15 provisions.
9. Chapter 15 requires a five foot separation to ground water or a specific engineered alternative which is consistent with this prescriptive standard. In this case the discharger has a 3 1/2 foot separation to ground water. The engineered alternative which provides the equivalence to the prescriptive five foot standard is the following double liner system (see Appendix B for a more detailed description of the system) :
  - a. The ponds will be lined with a high density, 80 ml polyethylene plastic membrane with a permeability of less than  $1 \times 10^{-7}$ .
  - b. A leachate collection system will be placed beneath the pond liners.
  - c. A second high density, polyethylene, 80 ml liner will be installed beneath the leachate collection system to insure a separation between this system and the ground water.
  - d. A drainage system beneath the second liner will be installed to insure a separation between the ground water and the second liner.
  - e. The drainage system is underlain by 10 - 60 ft. of bay mud with a  $1 \times 10^{-6}$  permeability.
10. The discharger is proposing to expand the current storage facilities for the following reasons:
  - a. Due to increasing wastewater flows and the recent enlargement of the MMWD reclamation facility, more sludge is being produced than can be stored in the existing sludge storage ponds. MMWD expects to expand its reclamation facility

in the future from 1 mgd to 2.0 mgd, producing an even greater volume of sludge.

- b. The new sludge pond location will permit more efficient operation of the sludge injection truck. The truck would not have to return to the treatment plant, except to refuel. Additionally, the substantial reduction in truck transport along the Miller Creek levy would result in less public and wildlife disturbance.
11. A geotechnical investigation was conducted beneath the dedicated landfill area in 1982 and beneath the proposed storage sites in 1991. These investigations indicated that the site is underlain by soft, compressible silty clays known as Bay Mud. The depth of this relatively impermeable mud (permeability generally less than  $1 \times 10^{-6}$ ), varies from 20-70 feet throughout the site.
12. The sludge landfill and proposed storage ponds are approximately 300 feet from the nearest surface water body, Miller Creek, tributary to San Pablo Bay. The shallow ground water in the area is unusable for drinking or irrigation purposes due to the high TDS content (8,000 - 10,000 mg/l). Ground water at a greater depth has not been characterized.
13. Ground water monitoring in the vicinity of the landfill for heavy metals has been conducted twice per year since on-site sludge disposal began in 1985. Three, down and cross gradient wells (G-2 to G-4 ) and one upgradient well have been installed. The monitoring results fluctuate widely and are not easily interpreted. Generally, the parameters tested for (Table 4-1 metals) do not exceed background levels and do not show an increasing trend over time. However, conclusions concerning the impact of sludge disposal on ground water quality cannot be made due to the poor quality of the data. The quality control in the sampling and analyses was poor. Numerous spikes and dips in the data were recorded and later attributed to sampling error or surface contamination. The wide fluctuations indicate that QA/QC improvements in sampling and laboratory protocol are necessary.
14. The arsenic level in well G-2 was the only parameter which demonstrated an increase over background levels and an increase over time. Due to poor QA/QC the data is questionable. Therefore, an intensive monitoring program for arsenic is necessary to evaluate the potential impact of arsenic on the ground water. Additional monitoring wells, and an increase in monitoring frequency will be required.
15. Metals analyses in the upper 12" of soil in the disposal area where sludge injection has occurred have indicated that cadmium, chromium, copper and zinc levels exceed the background levels. The metal levels are within the range considered typical for soils and significantly less than California Department of Health Services (DHS) Title 22 TTLC levels. To insure that TTLC levels are not exceeded in the future, a management plan for sludge application will be required.
16. The Regional Board adopted a revised Water Quality Control plan for the San Francisco Bay Region (Basin Plan) on December 17, 1986. The Basin Plan contains water quality objectives for San Pablo Bay and contiguous waters.

17. The beneficial uses of Miller Creek include:

- a. Water Contact and Non-Contact Water Recreation
- b. Wildlife Habitat
- c. Preservation of Rare and Endangered Species
- d. Fish Migration and Spawning

18. The discharger has been granted a Negative Declaration, in accordance with the California Environmental Quality Act.

19. The Army Corps of Engineers has determined that this project is not within their jurisdiction. All required local permits have been granted.

20. The Board in a public meeting, heard and considered all comments pertaining to this discharge.

IT IS HEREBY ORDERED pursuant to provisions of the California Water Code and regulation adopted thereunder, that the discharger shall comply with the following:

A. Prohibitions

- 1. No sewage sludge that contains contaminants in concentration in excess of thresholds defined in the Environmental Protection Agency's Hazardous Waste List and California Assessment Manual shall be disposed of in the dedicated landfill.
- 2. Sludge shall not be applied to the dedicated landfill between October 30 and May 1 unless prior written authorization is obtained from the Executive Officer.
- 3. Discharge of any liquid waste or contaminated runoff to any surface waters or drainage course is prohibited.

B. Specifications for Sludge Lagoons and Dedicated Landfill

- 1. Sewage sludge disposed of at the storage lagoons and dedicated landfill shall be limited to digested sewage sludge generated by the discharger and sludge from MMWD's reclamation facility unless an exception is authorized by the Executive officer.
- 2. The treatment and disposal of sewage sludge shall not cause a condition of pollution nor nuisance as defined by Section 13050(m) of the California Water Code.
- 3. The storage lagoons and dedicated landfill shall be protected from any washout or erosion of wastes and from inundation which could occur as a result of floods having a predicted frequency of once in 100 years.

4. The perimeter drainage ditches and other drainage facilities shall be maintained to convey the maximum anticipated rainfall runoff from the site to prevent inundation of the site.

#### C. Specifications for Sludge Lagoons

1. No sludge shall be stored outside the designated storage lagoons as shown in Attachment A.
2. Hydraulic continuity of the stored sludge with the underlying ground water shall be prevented by the presence of a double liner system consisting of the following:
  - a. Two, high density 80 ml polyethylene liners
  - b. A leachate collection system
  - c. A ground water drainage collection system beneath the lower liner
3. Monitoring wells shall be constructed to monitor the quality of the leachate from each storage pond and the underdrain systems to insure that the liners are not leaking.
4. There shall be no overflow from the storage lagoons.
5. A minimum freeboard of two feet shall be maintained in the sludge lagoons at all times.

#### D. Specifications for Dedicated Landfill Area

1. Sludge shall be injected six inches into the soil to minimize odor problems and wind erosion of surface sludge to surface waters.
2. No sludge shall be disposed outside the designated area as shown on Attachment A.
3. Ponded water or runoff from the disposal area shall not be discharged to adjacent land or ditches discharging to surface waters.
4. Disposal of sludge in the dedicated landfill shall not adversely impact beneficial uses of the ground water or Miller Creek.

## Provisions

Treatment, storage and disposal of sewage sludge must comply with the following requirements and provisions:

1. Solids treatment, storage and disposal shall comply with General Provisions A.9 and A.12 of the Standard Provisions and Reporting Requirements (attached).
2. The following tasks to assess ground water quality in the vicinity of the dedicated landfill shall be completed according to the following schedule:

Install an additional background monitoring well	October 15, 1991
Install an additional monitoring well between Miller Creek and existing well G-2	October 15, 1991
Provide a technical report to the Board which presents an assessment of the arsenic ground water monitoring data.	August 15, 1992
3. Submittal of Information

The following information must be submitted to the Executive Officer within 60 days of the effective date of this permit, unless submitted in a previous annual report. Any significant changes in the treatment, storage or disposal of sludge solids shall be reported in the subsequent annual report.

  - a. Annual sludge production in dry tons and percent solids.
  - b. A schematic diagram showing sludge handling facilities and a solids flow diagram.
  - c. A narrative description of sludge dewatering and other treatment processes, including process parameters. For example, if sludge is digested, report average temperature and retention time of the digesters.
4. The discharger shall provide written notice to the Board at least 90 days prior to making any significant changes in sludge disposal practices.
5. Duty to Comply

- a. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants and with standards for sludge use and disposal established under Section 405(d) of the Clean Water Act within the time provided in the regulations that establish these standards or prohibitions or standards for sludge use or disposal, even if the Permit has not yet been modified to incorporate the requirement.
  - b. The permittee shall comply with all federal and state regulations. 40 CFR 257.3-5 contains current EPA regulations regarding the application of sludge containing cadmium and PCBs to land.
  - c. The permittee is encouraged to comply with the State guidance manual issued by the Department of Health Services titled, " Manual of Good Practice for Landspreading of Sewage Sludge".
  - d. The Clean Water Act provides that any person who violates a Permit condition implementing Sections 301,302,306,307,308,318, or 405 is subject to a civil penalty per day of such violation. Any person who willfully or negligently violates Permit conditions implementing the Sections stated above is subject to an even stiffer fine per day per violation, or by imprisonment, or both.
6. Reopener
- In accordance with Section 13263 of the Water Code, these requirements are subject to periodic review and revision by the Board. The Board shall take into consideration the results of the self monitoring program whenever these periodic reviews occur.
7. Six months prior to discontinuing the use of the dedicated landfill for waste disposal, the discharger shall submit a technical report to the Board describing the methods and controls to be used to assure protection of the quality of surface and ground waters and prevent erosion of the area during final operations and with any proposed subsequent use of the land. This report shall be prepared by or under the supervision of a certified engineering geologist or registered civil engineer. The method used to close the site and maintain protection of the quality of surface and ground waters shall comply with waste discharge requirements established by the Board.
  8. The discharger shall provide written notice to the Regional Board at least 90 days prior to making any significant changes in sludge disposal practices.
  9. Requirements prescribed by this Order supersede the requirements prescribed by Order No. 84-37. Order No. 84-37 is hereby rescinded.
  10. The Discharger shall comply with the attached SelfMonitoring Program. The Board's Executive Officer may make minor amendments to this Self-Monitoring Program pursuant to federal regulations (40 CFR 122.63).

I, Steven R. Ritchie, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region on July 17, 1991.



Steven R. Ritchie  
Executive Officer

**Attachments:**

Standard Provisions and Reporting Requirements, December 1986 Self-Monitoring Program  
Site Map  
Appendix B



CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD  
SAN FRANCISCO BAY REGION

SELF-MONITORING PROGRAM  
FOR

LAS GALLINAS VALLEY SANITARY DISTRICT-

SLUDGE STORAGE FACILITIES AND SLUDGE

APPLICATION TO DEDICATED LAND DISPOSAL SITE

ORDER NO. 91-111

## I. GENERAL

1. All analyzes shall be performed by an approved (certified laboratory using generally acceptable methods or current EPA/State guidelines procedures for sampling and analyses of sludge, soil, and groundwater.
2. The sludge, soil, groundwater, and shall be submitted in accordance with the specifications described in this program. Any failures to conform to this program of sampling and analyses shall be explained in the subsequent report.

## II. REPORTING

Reporting to the Board shall normally be accomplished by the submission of a single annual report. This report shall be prepared by, or under the supervision of, a soil scientist, soils engineer, or other individual having a recognized expertise on the impacts of sewage sludge on soils and on surface and groundwaters. The annual report shall be submitted no later than May 15 of each year, and shall include the following:

### A. Annual Management Plan Update

This section shall describe the method of operation for the upcoming season and include the following as a minimum:

1. Sludge loading rate to be used, expressed in dry weight per unit area as kg/ha.
2. Method proposed for incorporating sludge into soil.

Where applicable, the management plan update should indicate changes to past practices that have been identified as being needed in the subsequent portion of the report.

### B. Report on Impact of Previous Sludge Applications

The overall intent of this section is to provide a comprehensive annual assessment of the project. This section shall include data presentation and a narrative evaluation of the sludge applied to the land, and of the impacts on soils, and groundwater below the site. Where problems are found to exist, proposed solutions shall be included.

## 1. Sludge

Present data on sludge composition on dry weight basis. All data shall be presented, and any anomalies found shall be discussed. Any significant changes from previous analyses shall be discussed.

## 2. Soils

For the Dedicated Land Site, the following table shall be completed based on the most recent data obtained:

Last date sampled \_\_\_\_\_

<u>Parameter</u>	<u>Prior Cumulative Loading</u>	<u>Soil Concentration, mg/kg</u>		
		<u>0-12"</u>	<u>12-24"</u>	<u>24-36"</u>
Sludge added as				
dry solid %				
Nitrogen				
Ammonium				
Nitrate				
TKN				
Arsenic				
Cadmium				
Chromium				
Copper				
Lead				
Nickel				
Mercury				
Silver				
Zinc				
PCB's				
pH				
Cation Exchange				
Capacity				

The data presented above shall be evaluated and discussed. This discussion shall also include the degree to which the sludge has been incorporated into soils at various depths (data may be useful in this assessment), and whether the project has had any effects on soil texture or workability.

Any changes in soil pH shall be described, together with probable reasons.

### 3. Groundwater

Present data on groundwater expressed in mg/l. All relevant parameters shall be compared with the background level and values in excess shall be discussed.

## III. SAMPLING AND ANALYSIS

### A. Sludge

1. During the period in which sludge is applied to the land directly from the sludge lagoon(s), sampling and analyses shall be performed bi-monthly over five consecutive days as follows:

- a. Samples shall be taken from each truckload leaving the plant or withdrawing from the lagoons.
- b. Equal volumes of the daily composites shall be combined into a five day composite. The 5-day composite shall be analyzed for the following:

pH, Percent Solids, Total Nitrogen, Ammonium Nitrogen, Nitrate Nitrogen, Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, Zinc, and PCB's.

All concentrations shall be expressed on a dry weight basis.

If PCB's concentration is less than 5 mg/kg then it shall be analyzed once a year.

2. The sludge lagoons shall be sampled annually before disposed to the dedicated land site. The lagoons shall be sampled at twenty representative points at various depth (1 to 3 feet). These samples shall be combined into a composite and analyzed for all parameters (i.e. Dry Wt. basis) specified in 1.b. above.

3. For the analyses given above

- a. Except for pH and percent solids, all parameters shall be expressed in dry weight basis (i.e. mg/kg).

- b. If PCB concentration in lagoons is less than 10 mg/kg then monthly analyses is not needed.
  - c. An analytical sensitivity for heavy metals of 0.1 mg/l shall be adequate.
4. Records on sludge produced, stored and disposed shall be maintained on a yearly basis.

B. Soils

1. Annual Testing

- a. Two diagonal transects shall be established for the disposal site. Each year prior to sludge application, a minimum of five (5) soil samples, spaced equidistantly shall be taken along each transect at 0 to 12 inches depth range. Soil sample shall be composited and analyzed for the following parameters:

pH, Lead, and Zinc

- b. A map showing the sample location shall be provided.

2. Comprehensive Testing

- a. Comprehensive testing shall be done prior to sludge application to define conditions that prevailed prior to the commencement of this monitoring program. After this initial testing, testing shall be conducted each time that approximately 90 dry tons of sludge per acre has been applied.
- b. For the disposal site to be sampled, two diagonal transects shall be established. Along each transect, and spaced equidistantly, a minimum of ten soil samples shall be taken at each depth.

Soil samples shall be taken for three depths: zero to twelve inches; twelve to twenty-four inches; and twenty-four to thirty-six inches. Soil samples from each depth (twenty samples per depth) shall be composited and analyzed for the parameters specified below.

**c. Analyses**

<u>Parameter</u>	<u>Unit</u>
pH	pH unit
CEC(2)	meq/100gm
Electric Conductivity	Millimhos/cm at 25°C
Texture(2)	
Ammonium-Nitrogen	mg/kg
Nitrate-Nitrogen	mg/kg
TKN	mg/kg
Arsenic	mg/kg
Cadmium	mg/kg
Chromium	mg/kg
Copper	mg/kg
Nickel	mg/kg
Lead	mg/kg
Zinc	mg/kg
PCB(1)	mg/kg

- (1) PCB shall be analyzed only when the sludge concentration exceeds 5 mg/kg.
- (2) To be analyzed only once to obtain background information in order to determine the variability in the field.

**C. Groundwater**

**1. Sampling Stations**

<u>Stations</u>	<u>Location</u>
G-1	Located outside of the northerly dike of the disposal site and within 5 feet of the dike.
G-2	Located outside of the westerly dike of disposal site and within 5 feet of the dike.
G-3	Located on the southerly dike of the disposal site.
G-4	Located on the easterly dike of the disposal site.
G-5	Located northeast of well G-2 in a direct transect between G-2 and the creek.

Additional background well to be located in an appropriate upgradient position.

## 2. Analyses

<u>Parameter</u>	<u>Unit</u>
Depth to water	ft.
pH	pH unit
Conductivity	mhos/cm at 25°C
Chloride	mg/l
Cadmium	mg/l
Chromium	mg/l
Copper	mg/l
Nickel	mg/l
Lead	mg/l
Zinc	mg/l
Arsenic	mg/l

Monitoring wells shall be constructed in accordance with standard procedures for constructing monitoring wells.

Monitoring well sample collection shall be in accordance with standard procedures including the purging of the well a minimum of three volumes prior to sampling.

3. All stations shall be sampled quarterly for the above named constituents with the exception of arsenic. Arsenic shall be monitored monthly until it is demonstrated to the satisfaction of the Executive Officer that arsenic levels are not significantly increasing above background levels.

## D. Monitoring of the Sludge Lagoons

1. Monitoring of the wells installed in the leachate collection and drainage systems shall be quarterly for the following parameters:


pH  
Conductivity  
TDS  
chloride  
BOD

2. Monitoring of these wells shall be conducted in March and October for the constituents in D.1. above and the following constituents:

Cadmium  
Chromium  
Copper  
Nickel  
lead  
zinc  
arsenic

I, Steven R. Ritchie, Executive Officer, hereby certify that the foregoing Self-monitoring program:

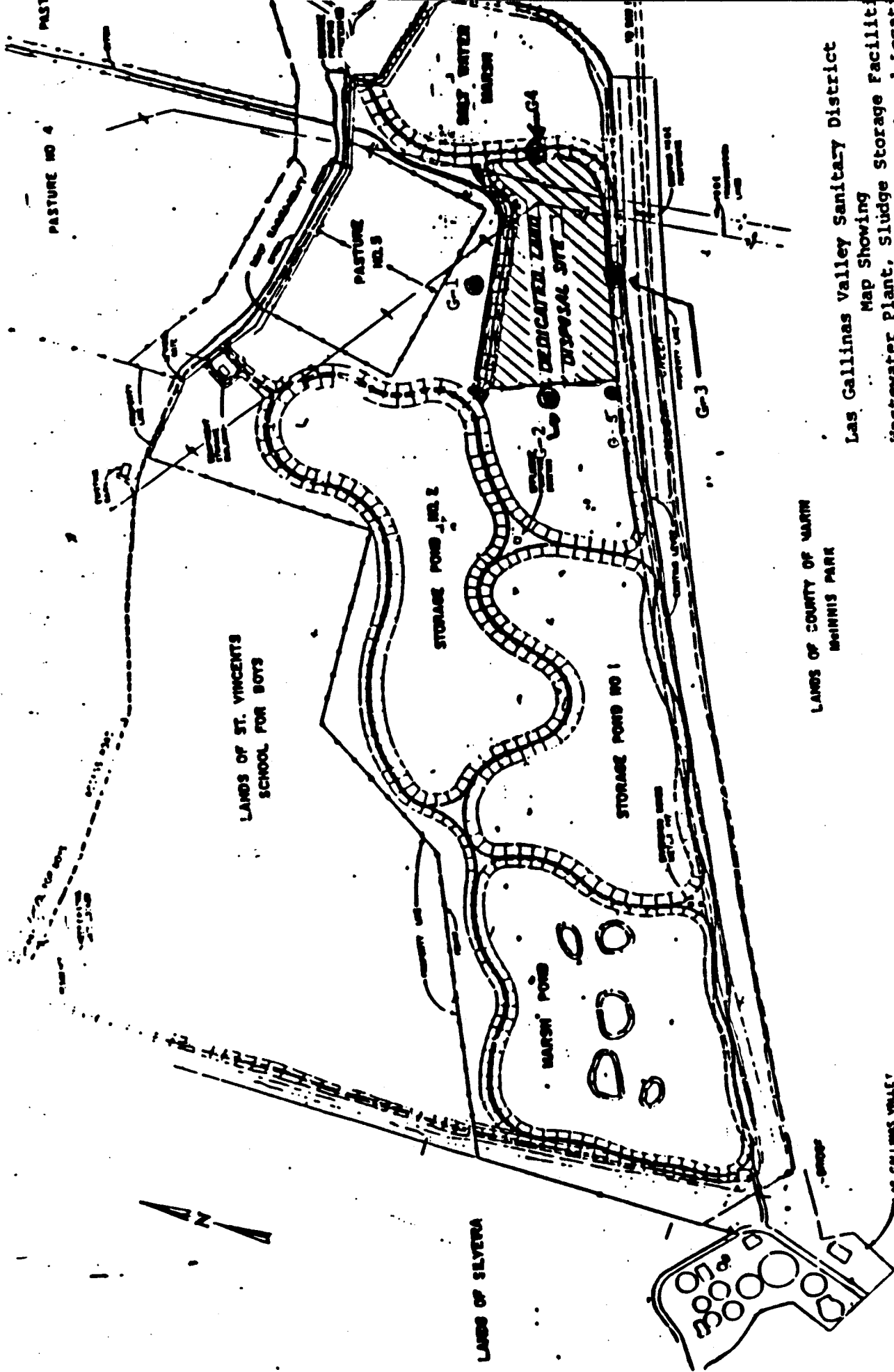
1. Has been developed in accordance with the procedure set forth in this Regional Board's Resolution No. 73-16 in order to obtain data and document compliance with sludge disposal specifications established in the Board Order No. 84-37.
2. Is effective on the date shown below.
3. May be reviewed at any time subsequent to the effective date upon written notice from the Executive Officer or request from the discharger, and revisions will be ordered by the Executive Officer.

  
Steven R. Ritchie  
Executive Officer

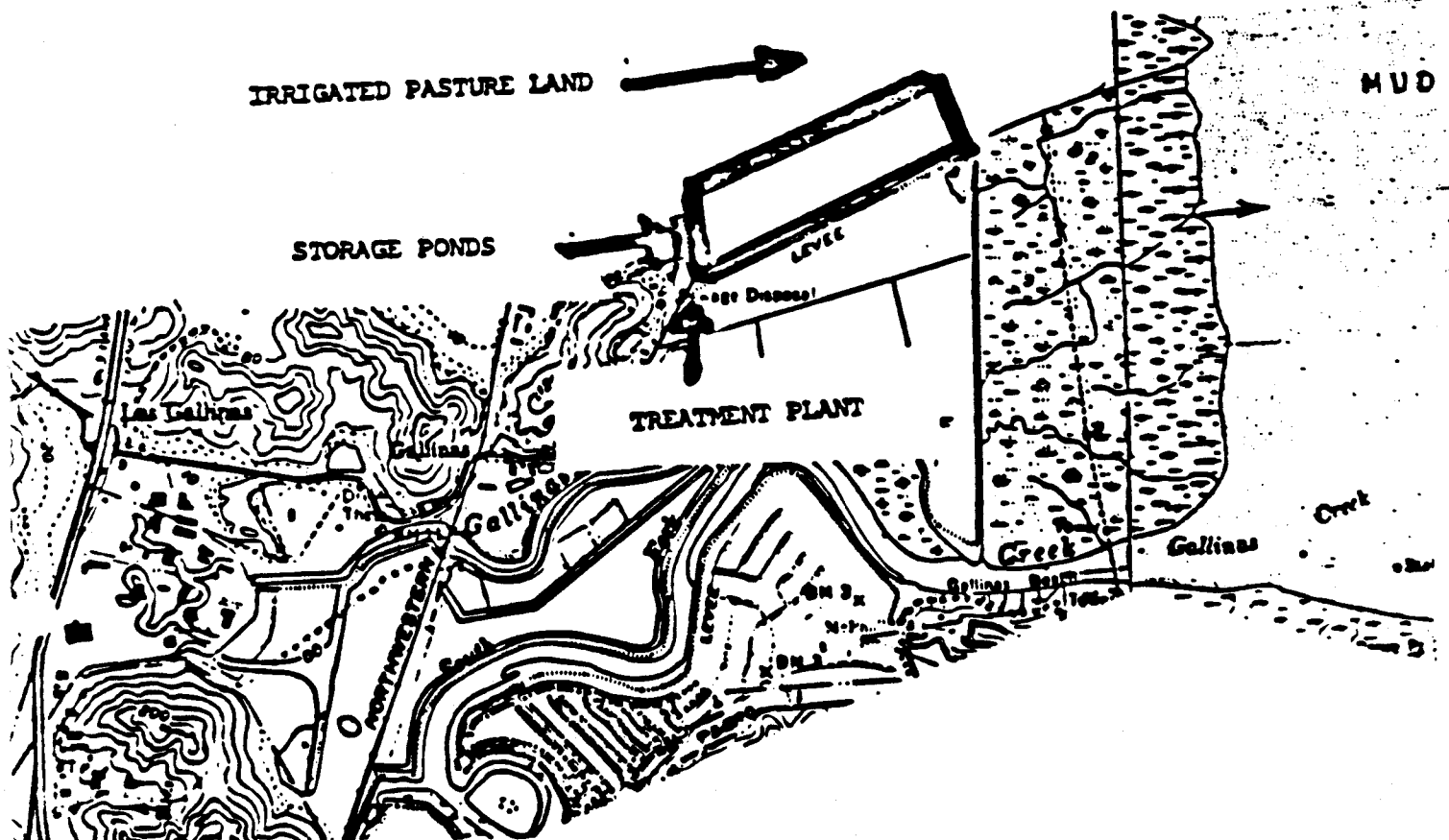
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Attachment: Map of the Dedicated Land  
Disposal Site with sampling location(s)





Las Gallinas Valley Sanitary District  
 Map Showing  
 Wastewater Plant, Sludge Storage Facilities  
 Sludge Dedicated Land Disposal and Location  
 of Monitoring Wells  
 Order No. 84-37



## APPENDIX B

levees would have to be over 20 feet high, which would make them completely unstable even with use of lightweight fill. Other sites for these ponds with more favorable ground water conditions are not available on District property. The surrounding area is being rapidly urbanized, and most of the uplands are now being developed.

Because it is not technically feasible to provide a 5-foot vertical separation between the pond bottom and ground water surface at the proposed site, there can be no economic comparison.

### **PROPOSED MITIGATION DESIGN**

Since there is no alternative to the use of the existing diked bay lands, it is proposed that the ponds be constructed with a double liner incorporating both a leachate drain and a ground water drain. The double liner system will consist of the following, described from the top down as shown in the attached drawing.

1. **Pond Bottom Liner** - The upper liner will be 80-mil thick high density polyethylene liner material, thermally welded together, which will provide an impermeable barrier between the sludge in the ponds and the leachate collection system below.
2. **Leachate Collection System** - The leachate collection system will consist of a 0.2-inch thick polyethylene drainage grid sandwiched between the upper and lower liners and sloping to a central collector drain consisting of perforated polyethylene pipe encased in crushed rock. The central collector drain will run the length of the pond in its center and will slope to a monitoring well so that any leakage of the upper and lower liners can be detected.
3. **Lower Liner** - The lower pond liner will be high density 80-mil thick high density polyethylene material, thermally welded together, which will provide a second impermeable barrier that will separate the leachate collection system from any ground water.
4. **Drainage Collection System** - A drainage collection system will be provided below the lower liner. The drainage collection system will consist of one foot of crushed rock between the lower pond liner and a geotextile fabric. The geotextile fabric, equivalent to Mirafi 140NS, will prevent the underlying bay mud from contaminating and scaling up the crushed rock. A collection pipe will be provided at the lowest point of the drainage collection system and will slope to a monitoring well so that the level of ground water can be monitored and pumped out when necessary.

In summary, in lieu of a 5-foot natural separation of the pond contents and ground water, the above-described double liner system will provide an impermeable barrier. This system will allow monitoring of pond leachate in the event the pond liner ruptures and also allow monitoring of ground water below the double liner system. The proposed mitigation design will meet the intent of the 5-foot ground water separation requirement.